General Chemistry I: Structure
Chemistry 121

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In this course I hope to introduce you to the fundamentals of chemistry. As an introductory course which is only the first step in a multi-course sequence, the material we cover will not present a complete picture of chemistry. The picture will by necessity focus on inorganic chemistry (rocks, minerals, salt, etc.) and specifically the topics of bonding and structure. Some time will be spent on stoichiometry, chemical equations and equilibrium effects as well. There will be no biochemistry, organic chemistry (chemicals that make you live and breathe like DNA, proteins, sugars, etc.) and only minimal physical chemistry in this course; these topics will wait for later in your careers (though I am happy to discuss any chemistry topic outside of class if you have interest.) In addition, you will gain some insight into the process known as the scientific method as it relates to the development of theories in chemistry. What does all this mean to you as a student? Hopefully, it means you will have a better understanding of what makes your car run (combustion reactions), how Crystal Drano works (acid/base chemistry) or be able to differentiate a diamond (molecular crystal) and a salt (ionic crystal). Maybe you'll get a feel for what makes a reaction generate heat or how that heat can be used to do work. In addition, I hope you are left with a feeling for the evolution of atomic theory and some understanding of the complexities of quantum mechanics. The lecture schedule has specific dates for each section of the textbook, including problem solving dates. It is to your benefit to bring specific homework questions to these (in fact all) lectures. The advantage to you the student will be more exposure to doing the word problems that students seem to find so challenging in chemistry. You will need to read the text thoroughly and come prepared to think about problems. If at any time in the course you wish I would do something different, let me know. My door is open for comments and questions and I really do hope to see all of you regularly.

We meet Monday, Wednesday and Friday in Room 106 at 10:00 am. I will hold 9 office hours where I will normally be available in my office for drop-in visitation/questions unless otherwise posted. These will be Monday from 9-10 & 3-4, Tuesday 9-11 & 1-2, Wednesday 9-10, and Thursday 9-11 & 1-2. Any other times that my door is open I am available for questions or comments (please recognize that if you cannot go to a scheduled office hour, you should talk to me about finding times that will work for you). The laboratory for this course will be in room 313 or room 305 and meets from 2-5 on Wednesday afternoons (10-40 minute pre-laboratory lecture will be in room 306). Note that the laboratory sessions are **not** optional and you are expected to attend both the pre-laboratory and subsequent laboratory sessions.

The grading policy will be based on the following schedule. You will *not* be required to hand in homework problem sets (see last page of syllabus for complete assignments) but these will certainly help you perform better on tests and quizzes. I will be happy to go over any assignment problems outside of class during office hours or alternatively during problem days on the lecture schedule. There will be 10 laboratory experiments assignments worth 200 points (20 points each). Laboratory notebooks will be graded based on completeness (did you answer all the questions, did you conduct the experiment, did you interpret your data) rather than quantitative accuracy (this can wait until CHM341). There will be three one hour long tests worth 390 points (130 points each). *The tentative test days will be on the Fridays of September 29th, October 27th, and December 3rd*. These tests will focus on the most current material but all chapters are fair game and tests will be cumulative in nature. There will be a comprehensive final exam worth 250 points on *Thursday, December 14th at 3pm*. Tests will be graded very objectively for accuracy of answers. Normally each test will have about 1/3 multiple choice questions to help you prepare for the future when you will take MCAT, LSAT, GRE which are entirely multiple choice. As well there will be some fill in the blank, short essay and word problems on these exams. There will be quizzes given most days (20 quizzes) which will consist of a single short question and will account for 100 points (5 points each). You will also be expected to attend one of the scheduled chemistry seminars on one of four Wednesday evenings at 5 or 7 PM (September 20th, October 18th, November 8th or 15th, and November 29th) and write a short (200 – 400 words,1 page, double spaced, 12 point times font) essay on what was discussed in the seminar which is worth 60 points. An example essay is included on the last page of this syllabus. You will be graded based upon the quality and organization of your writing and not upon technical substance (you don't have to fully understand all the presented science.) The grading for the course will be 100-92% for an A (minimum 920 points), 91-79% for a B (minimum 790 points), 78-63% for a C (minimum 630 points), 62-50% for a D (minimum 500 points) and anything less an F.

Assignment	Points each	Total Points
Laboratory Write-ups (10)	20	200
Midterm Exams (3)	130	390
Quizzes (20)	5	100
Final Exam	250	250
Chemistry Seminars (1)	60	60
Grand Total		**1000**

The textbook used for this course is *Chemistry: The Central Science,* 8th Ed., by Brown, LeMay and Bursten. The laboratory manual is Berea's own and may be found at the college bookstore next week. In addition you will need a laboratory notebook (bound and lined, do not bring use a spiral bound notebook for laboratory), laboratory splash goggles, laboratory apron (no shorts or sandals permitted in lab), permanent-ink pen, and a scientific calculator (might find at Wal-Mart, etc.) Upper division chemis-

try majors will offer tutoring (as part of their labor assignments) on some of the evenings in the science library; times and dates will be announced later.

The attendance policy shall be that all labs must be completed, including laboratory write-ups. Also, it is expected that you attend all lectures. Up to two days may be missed without excuse, any subsequent absences will lead to a grade reduction of 15 points for each additional missed day (for example, if you skip class a total of 8 times, you would lose 6 x 15 = 90 points). Absence shall not be an excuse for failure to learn information covered in the course examinations. In cases involving extended absences for a good reason (for example hospitalization, emergency at home, etc.) a special arrangement will be made between us as to how to make up the missed material or exams.

Chemistry 121 Lecture/Homework Schedule

September 1st	Go over syllabus, Introduction to Course	
September 4th	Study of Chemistry, Matter HW 1.10, 1.23, 1.36, 1.49, 1.50, 1.57, 1.61, 1.66, 1.73	Chapter 1.1-1.3
September 6th	Measurement, Uncertainty	Chapter 1.4-1.6
September 8th	Problem solving from chapter 1	
September 11th	Atomic Theory, Periodic Table HW 2.4, 2.14, 2.18, 2.21, 2.32, 2.43, 2.63, 2.67	Chapter 2.1-2.4
September 13th	Compounds	Chapter 2.5-2.7
September 15th	Problem solving from chapter 2	
September 18th	Chemical Equations, Atomic Weights HW 3.4, 3.10, 3.15, 3.20, 3.28, 3.41, 3.46, 3.58, 3.61, 3.90	Chapter 3.1-3.3
September 20th	The Mole, Empirical Formulas	Chapter 3.4-3.5
September 22nd	Problem solving (Dr. Baltisberger will be absent)	
September 25th	Calculations with Chemical Equations	Chapter 3.6-3.7
September 27th	Problem solving from chapters 1-3	
September 29th	**Examination 1 (chapter 1 - 3)**	**Friday**
October 2nd	Go over test, Aqueous solutions HW 4.7, 4.12, 4.16, 4.20, 4.27, 4.34, 4.47, 4.54, 4.61, 4.74, 4.84, 4.96	Chapter 4.1-4.2
October 4th	Mountain Day (no class, go climb the pinnacle)	
October 6th	Acids, Bases & Salts, Ionic Equations	Chapter 4.3-4.4
October 9th	Reactions, Problem solving chapter 4	Chapter 4.5-4.6
October 11th	Stoichiometry and Chemical Analysis	Chapter 4.7
October 13th	Energy, First Law of Thermodynamics, Enthalpy HW 5.4, 5.8, 5.13, 5.19, 5.30, 5.38, 5.46, 5.62, 5.71, 5.78, 5.88, 5.99	Chapter 5.1-5.3
October 16th	Reading Period (no class)	
October 18th	Calorimetry, Hess's Law, Enthalpy of Formation	Chapter 5.4-5.7
October 20th	Problem solving (Dr. Baltisberger will be absent)	
October 23rd	Waves, Photons, Bohr Model HW 6.7, 6.12, 6.17, 6.26, 6.32, 6.46, 6.48, 6.57, 6.61, 6.69, 6.87	Chapter 6.1-6.3

October 25th	Wave behavior of matter, Quantum Mechanics, Orbitals	Chapter 6.4-6.6
October 27th	**Examination 2 (chapter 1 - 5)**	**Friday**
October 29th	Go over test, Problem solving from chapter 6	
November 1st	Many electron atoms, Electron configuration	Chapter 6.7-6.9
November 3rd	Periodic table, Sizes of atoms, Ionization energy HW 7.12, 7.15, 7.24, 7.33, 7.38, 7.50, 7.59, 7.75	Chapter 7.1-7.3
November 6th	Electron affinity, Groups	Chapter 7.4-7.7
November 8th	Problem solving from chapter 7	
November 10th	Go over test, Octet Rule, Lewis Symbols, Ionic Bonding HW 8.6, 8.13, 8.22, 8.28, 8.36, 8.44, 8.47, 8.54, 8.61, 8.69, 8.92	Chapter 8.1-8.3
November 13th	Covalent bonding, Polarity, Lewis structures	Chapter 8.4-8.6
November 15th	Problem solving from chapter 8	
November 17th	Resonance structures, Exceptions, Oxidation numbers	Chapter 8.7-8.10
November 20th	Molecular Shape, VSEPR HW 9.8, 9.13, 9.19, 9.26, 9.32, 9.37, 9.44, 9.54, 9.73	Chapter 9.1-9.2
November 22nd	Polarity, Orbital Overlap, Hybrid Oribitals	Chapter 9.3-9.5
November 24th	No class (Thanksgiving Break)	
November 27th	Problem solving from chapter 9	
November 29th	Multiple bonds, Molecular orbitals, Diatomics	Chapter 9.6-9.8
December 1st	Review from chapter 7-9	
December 3rd	**Examination 3 (chapters 1-9)**	**Friday**
December 6th	Go over test, review chapter 1-6	
December 14th	**Final Examination**	**Thursday, 3 PM**

Sample seminar response essay:

Seminar Title: Spin Gymnastics
Seminar Speaker: Professor Alex Pines
Seminar Date: May 4th, 1999

By John Q. Student

I attended the seminar by Professor Pines on Tuesday evening, May 4th. In his seminar he described a wide range of experiments he has led while studying nuclear magnetic resonance (NMR) at the University of California at Berkeley. I was rather confused by all the talk of quantum mechanics and operators, but when he showed the stick picture of "rotating magnetization", I was able to get some idea of what he was trying to explain. The example of dropping a person on a piano and listening to the result rather than playing it note by note made a lot of sense. It is clear that all the notes are present when you drop the person and that the person landing on the piano might hit some notes harder where they are bigger/heavier and thus by analyzing the intensities you get a picture of the person. Pines explained that modern medical imaging is related to this sort of idea by making our "spins" depend upon where they are in the person and them taking a picture of the person using them. I have read a lot about magnetic resonance imaging (MRI) and how it helps to determine injuries and illnesses. The other aspect of Pines' talk that I found very interesting was how he was doing experiments that no one else had ever thought of before. It was impressive how he seems to know so much about such a wide range of topics. It was neat to see how he has used NMR over the years to do things like figure out the structure of a molecule, to count the number of atoms in a cluster or even to spin the sample in those fancy "trajectories" to get very pretty looking spectra. It is fascinating to me that each molecule has a unique fingerprint, much like people, that can be found in the NMR spectra. On the whole, a lot of what Pines said confused me but many of his simple stick figure models made sense and ultimately I learned a little bit how MRI works. I would be interested in learning more about this important medical technology in the future.